

NEW SOLUTIONS FOR THE GPS FIELD APPLICATIONS. COGO APPLICATIONS

Nicolae Ion BĂBUCĂ, Ph.D. Eng., „Politehnica” University of Timisoara, Romania, crisi.babuca@gmail.com

Abstract: COGO is an application program for coordinate geometry calculations such as:

- ✓ coordinates of points.
- ✓ distances between points.
- ✓ bearings between points

The calculations can be made from:

- ✓ existing point data in the job, known distances or know azimuths.
- ✓ measured points.
- ✓ entered coordinates.

The most important condition for obtaining good results is sky visibility at the points where GPS receivers are positioned. Thus, determinations can neither be made in forests or tree lines, nor in areas with very large structures, etc

Keywords: COGO Calculation methods, GPS technology.

1. Introduction

The COGO calculation methods are:

- ✓ Inverse
- ✓ Traverse
- ✓ Intersections

2. Description

It is possible to compute an inverse result between point, line and arc elements:

2.1.1 Method 1: Inverse between point – point

To compute an inverse between two known points.

Known elements:

P1 First known point (From)

P2 Second known point (To)

Unknown elements:

α Direction from P1 to P2

d1 Slope distance between P1 and P2

d2 Horizontal distance between P1 and P2

d3 Height difference between P1 and P2

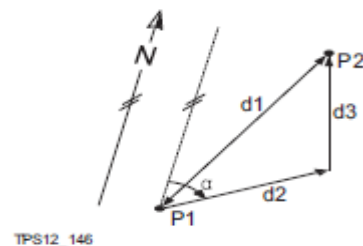


Figura 1 Inverse between point – point

2.1.2 Method 2: Inverse between point - line

To compute an inverse between a known point and a given line (the inverse is computed as the perpendicular between the known point and the given line).

Known elements:

- P0 Instrument station
- P1 Starting point
- P2 End point or the direction from P1 to P2
- P3 Offset point

Unknown elements:

- P4 Base point
- d1 The perpendicular offset to the base point
- d2 The distance along the line

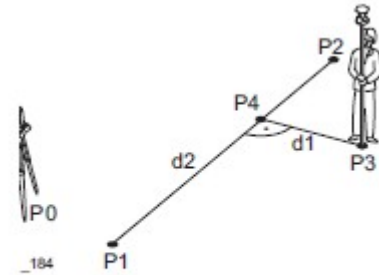


Figura 2 Inverse between point – line

2.1.3 Method 3: inverse between point - arc

To compute an inverse between a known point and a given arc (the inverse is computed as the perpendicular between the known point and the given arc).

Known elements:

- P0 Instrument station
- P1 Starting point
- P2 End point
- P3 Offset point
- P4 Second point or arc radius or arc/chord length

Unknown elements:

- P4 Base point
- d1 The perpendicular offset to the base point
- d2 The distance along the arc

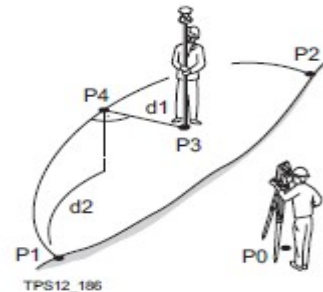


Figura 3 Inverse between point – arc

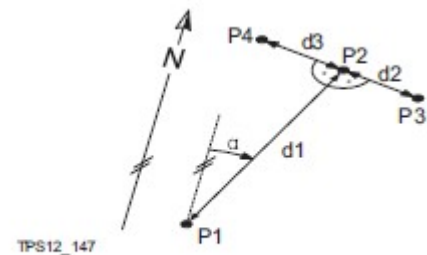
2.1.4 COGO Calculation - Traverse Method. COGO traverse calculation with offset for a single point.

Known elements:

- P1 Known point
- α Direction from P1 to P2
- d1 Distance between P1 and P2
- d2 Positive offset to the right
- d3 Negative offset to the left

Unknown elements:

- P2 COGO point without offset
- P3 COGO point with positive offset



P4 COGO point with negative offset

Figura 4 Traverse method

2.1.5 COGO Calculation - Traverse Method. COGO traverse calculation without offset for multiple points

Known elements:

- P1 Known point
- α_1 Direction from P1 to P2
- α_2 Direction from P2 to P3
- α_3 Direction from P3 to P4
- α_4 Direction from P3 to P5
- d1 Distance between P1 and P2
- d2 Distance between P2 and P3
- d3 Distance between P3 and P4
- d4 Distance between P3 and P5

Unknown elements:

- P2 First COGO point
- P3 Second COGO point
- P4 Third COGO point - sideshot
- P5 Fourth COGO point

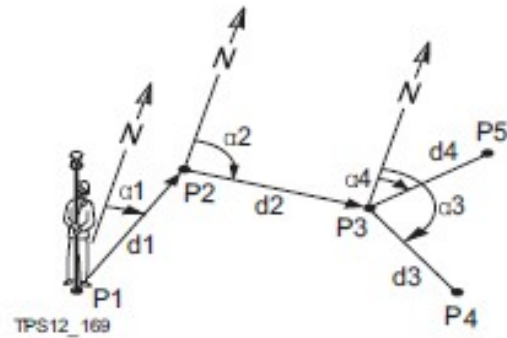


Figura 5 Traverse method without offset

2.1.6 COGO Calculation - Traverse Method. COGO Calculation - Intersections

Method

Bearing - Bearing

Known elements:

- P1 First known point
- P2 Second known point
- α_1 Direction from P1 to P3
- α_2 Direction from P2 to P3

Unknown elements:

- P3 COGO point

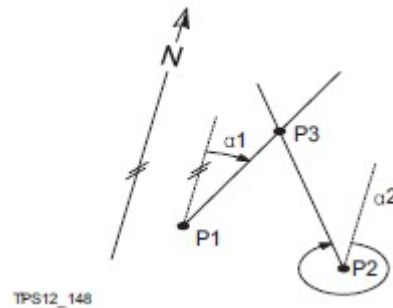


Figura 6 Traverse method –bearing-bearing

Bearing - Distance

Known elements:

- P1 First known point
- P2 Second known point
- α Direction from P1 to P3 and P4
- r Radius, as defined by the distance from P2 to P4 and P3

Unknown elements:

- P3 First COGO point
- P4 Second COGO point

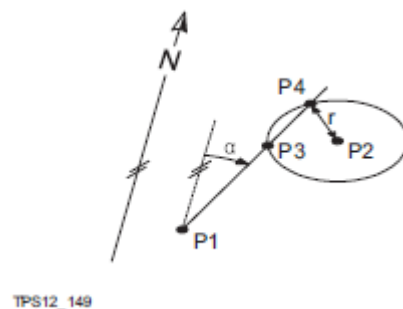


Figura 7 Traverse method –bearing-distance

3. Conclusion

The coordinates of the points must be known. The points:

- ✓ may be taken from the active job.
- ✓ may be measured during the COGO calculation.
- ✓ may be entered manually.

This applications are very useful for stakeout points is more directly in the field using combined methods, which apply directly to the GPS receiver is found.

4. References

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